

JOURNAL OF THE ROYAL SOCIETY OF WESTERN AUSTRALIA,
VOL. XIX., 1932-33.2.—THE ORIGIN OF THE LIQUID APPEARING FROM THE SOFT
SPINES AND THE TAIL OF THE LIZARD—DIPLODACTYLUS
SPINIGERUS.—GRAY.

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INTRODUCTION.

The lizard *Diplodactylus spinigerus* belongs to the family Geckonidae, and is confined in its distribution to Australia. It possesses a double row of soft spines which run down the dorsal surface of the tail and extend up the back for some distance.

From these spines, and perhaps from the skin between the spines, these lizards are capable of ejecting a stream of liquid, in some cases, as far as one or two feet.

With the object of discovering whether this liquid comes from small vessels associated with the hæmolymph system or is secreted by special glands, a number of sections of the tail were examined, and it was found that the sub-epidermal layer contained dense aggregations of small vessels.

HISTOLOGY OF THE TAIL.

The tail is made up of a central piece of semi-cartilaginous tissue, surrounded by a ring of connective tissue which possesses a number of well developed fibres. External to this are several longitudinal layers of muscle fibres and investing these a thick layer of fibrous connective tissue containing muscular fibres. From this to the epidermis, a varying distance, the predominating tissue is of a loose areolar type, in which a number of small vessels ramify. Beneath the epidermis is a dense aggregation of these vessels. From this aggregation, through the epidermis to the exterior, run a number of capillaries which, however, end a short distance before the outermost epidermal layer.

The epidermis is full of pigment granules and the vessels are in most cases outlined with a similar deposit of pigment.

The spines in transverse section show a central mass of areolar tissue containing ramifying vessels, surrounded by the epidermis, into which finer branches of the areolar vessels enter, ceasing a short distance from the surface. There are no indications of either glands or gland ducts present.

Note on Synonymy.—The synonymy is that of Zietz (Rec. S. Austr. Mus. 1. No. 3 (1920), p. 185). The examination of over forty specimens shows that *D. spinigerus*, Gray, and *D. ciliaris*, Blng., pass into one another through numerous intermediate stages, and may approach the form of *D. intermedius*, Ogilby, recorded from Day Dawn by Werner (Fauna Sudwest-Austr. 11 (1910), p. 457, fig. 2). *D. strophurus* (D. & B.) does not appear to occur in Western Australia.

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METHOD OF EJECTION.

Considerable pressure is required to project a stream of liquid a distance of a foot or more, and an examination of the tail shows no obvious muscular mechanism which might be responsible for the process.

The small vessels in places appear to run together to form small chambers or sacs, which are shown as large black dots in the accompanying plate. It is probable that the small chambers are contractile and act as reservoirs for the material ejected; regression of the fluid back through the vessels could undoubtedly be prevented by means of valves, and the only method of escape for the contained liquid, when the small sac contracted, would be by a rupture of a small portion of the epidermis. A sudden break occurring in this way might result in the ejection.

It is unlikely that these small vesicles would be under voluntary control, and under these circumstances the innervating agent of contraction would possibly be a hormone, derived from the adrenal gland. This hormone is secreted in Mammals in times of fear or other mental or physical excitement. It possesses the ability in all Vertebrates of causing the contraction of smooth muscle in the body, and its action on these small contractile sacs can easily be realised.

The only case similar to this, known to the author, in the animal kingdom, is that mentioned by the American Zoölogist, Newman,¹ who quotes the case of the horned toad, *Phrynosoma*, which projects a tiny stream of blood from the corner of the eye. There is probably a similar arrangement for the projection of the stream in this case, as in the case of *Diplodactylus spinigerus*, that is, a small contractile sac, possibly (in this case) a dilatation of a venule, which would place the contained fluid under pressure, rupturing would take place near the surface and a small stream of blood shot out.

DISCUSSION.

The value of this peculiar mechanism to the animal concerned is a matter for debate. Since there are no special glands in *Diplodactylus spinigerus* producing the liquid ejected it is unlikely that it would have any poisonous property, although it is known that the English hedgehog possesses lymph which has poisonous properties.

Birds commonly attempt to pick up lizards by their tails. Lizards of the Gecko group possess the ability of parting autonomously with their tails, usually leaving them in the beaks of the predating birds, and developing new ones by natural regeneration. *Diplodactylus spinigerus* parts with its tail rarely, if at all, and it is likely that the lizard has developed a new method of preserving its life. One can quite imagine that the ejection of a liquid with some force from the tail would tend to nonplus any predator attempting to catch the lizard. This appears to be the most likely explanation of the value of such a mechanism to *Diplodactylus spinigerus*, and similarly the projection of a stream of blood from the corner of the eye of *Phrynosoma*, would disconcert any attacking animal.

SUMMARY.

The liquid ejected from the soft spines and the skin of the Gecko, *Diplodactylus spinigerus*, is apparently derived from the hæmo-lymph system; it is probably lymphoidal in nature and is ejected from a system of sub-epidermal lymphatics, the liquid reaching the exterior under pressure through rupture of the epidermis.

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BIBLIOGRAPHY.

1. Newman, H., Vertebrate Zoology, New York, 1920.



Magnification: $\times 350$.

Photomicrograph of portion of the tail of *Diplodactylus spinigerus*, and a section through one of the soft spines. A number of black lymphatics may be seen in the extensive sub-epidermal areolar tissue and the aggregation just beneath the epidermis is also plainly visible. A number of fine capillaries may be seen crossing the epidermis.